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BIOLOGICAL EVALUATION OF THE SOUTHERN PINE BEETLE ON THE BIENVILLE NATIONAL FOREST

U. S. Forest Service
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U. S. DEPARTMENT OF AGRICULTURE -- FOREST SERVICE
SOUTHEASTERN AREA, STATE AND PRIVATE FORESTRY
RESOURCE PROTECTION UNIT, FOREST INSECT AND DISEASE MANAGEMENT GROUP

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BIOLOGICAL EVALUATION OF THE SOUTHERN PINE BEETLE ON THE BIENVILLE NATIONAL FOREST

by

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A biological evaluation was conducted on the Bienville National Forest, Bienville and Strong River Districts, the week of August 28, 1978. The purpose of the evaluation was to determine the status of the southern pine beetle (Dendroctonus frontalis Zimmerman) populations in the area and to determine what action, if any, should be taken in FY 79.

METHOD OF EVALUATION AND ANALYSIS OF SPB INFESTATION

Aerial Survey

Standard aerial sketch map procedures were used for this evaluation, except that survey coverage was 100 percent.[2/] District personnel made the survey and spots of red and/or fading trees were recorded and plotted on Forest Service Class A maps.

Attack/Emergence Evaluation

The attack:emergence analysis procedure for estimating SPB population trends was adapted as a predictive tool.[3/] Analysis of population trends of the SPB by this procedure predicts future spot growth based on the ratio of southern pine beetles entering the trees to the number of beetles emerging (this is both attacking adults and developed brood). For purposes of this evaluation, the procedure will be referred to as the attack:emergence ratio. This procedure predicts future spot growth of spots based on data taken in the fall

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1/ Entomologist, USDA, Forest Service, Southeastern Area, State and Private Forestry, Pineville, La.

2/ Detection of Forest Pests in the Southeast, 1970. USDA, USFS, Southeastern Area, State and Private Forestry, Publ. S&PF-7, Atlanta, GA. 51 p.

3/ Moore, Gordon E. 1977. Factors for Determining Trends in Southern Pine Beetle Spots. J. Environ. Entomol. Vol. 7, No. 3. pp 335 - 341.

of the year. A prediction of SPB increase would require an attack:emergence ratio of 1:10 or greater. Attack:emergence ratios for spots predicted to remain static in growth would be 1:5 - 1:9.9. A decreasing population would have an attack:emergence of less than 1:4.9. This procedure has been proven on a spot basis for a 2-year period in North Carolina.[3/] This evaluation assumes that spot growth as predicted by the attack:emergence bark sample analysis will continue on the forest on an area basis. Predictions are then made using FY 78 project accomplishment data as a baseline. Future analysis will show how well area SPB trends can be predicted from spot trends.

Spots were stratified and observed in size classes 1 - 10, 11 - 20, and > 20 trees (aerial observation). Since most spots were greater than 20 trees, only one spot in this size class (1 - 10) was evaluated. The other size classes (11 - 20, > 20) two spots were evaluated. Five spots were sampled on each district. This provided a minimum 20 percent stratified sample recommended by G. Moore (1977).[3/] (See table 1).

Supplementary Spot Growth Evaluation

Additional spot growth data was taken to corroborate estimates made with attack:emergence procedure. Spot growth data was taken from the counties of Wayne, Clark, Jones, Jasper, Covington, Smith, Jefferson Davis, Simpson, and Rankin. These counties encompass the area of the Bienville National Forest and no differences have been noted when measuring spot growth on these areas. Spot growth evaluations identify the amount of spot growth occurring and some of the site/stand factors that contribute to that growth. A spot growth hazard index has been developed for each spot. This index compares the number of new attacks (trees) to the number of trees going inactive for the same period of time $\frac{(\#\ \text{new attacks})}{(\#\ \text{new inactive})}$.

RESULTS

Twenty-one new spots were found on the Bienville District ranging in size from one to 85 trees. The Strong River District had 15 spots of red and/or fading trees ranging from one to 15 trees. Five trees per spot were sampled with the results being shown in table 1 (in smaller spots, three trees per spot were sampled). Attack:emergence ratios were found to be static (A/E 1:5 - 1-9.9) (G. Moore 1977).

A static condition means an SPB spot with 50 active trees in October would perpetuate itself throughout the year and would still have 50 active trees if rechecked 1 year later. This means that during the course of the year, the spot mortality will total at least 100 trees if it only regenerates itself one complete

time. Thus, FY 79 mortality should equal the mortality sustained in FY 78.

Predicted Losses and Volume Protected -- Bienville NF - FY 1979

	Mortality (MBF)	Volume protected (MBF)		
		Present Vol. Protected	Growth	Total
Strong River	877.59	2351.03	867.05	3218.08
Bienville	2222.23	6000.7	740	6740.7

(2.7 is Affected/Protected ratio from Strong River -- It is considered the same for the Bienville District based on spot growth characteristics observed June - September 1978).

2222.23 MBF is volume reported last year on Bienville District -- This volume times Affected/Protected Ratio plus the growth of immature timber equals the Volume Protected.

The volume which would be protected by having a project was estimated by use of spot growth formulas. Spot growth formulas estimate the amount a spot would grow if not salvaged. The difference between salvage volume and the size the spot would have grown if left alone is the volume protected (Hedden 1976). When compared to the volume affected, this ratio can be used to measure benefits (volume protected) of the control effort. This ratio is considered to be the same on the Bienville District as it is on the Strong River District. This is in part due to the proximity of the districts.

Spot Growth Evaluation

Based on spot growth observations in the counties of Wayne, Clark, Jones, Jasper, Covington, Smith, Jefferson Davis, Simpson, and Rankin, the spot growth hazard index for the Bienville National Forest is 1.34. A spot growth hazard index of 1.0 indicates that new trees are being attacked at the same rate that beetles are vacating older attacks. An index of 1.34 indicates that spots are expanding 34 percent faster than they are going inactive. These observations were made over a period of time extending from June 4, 1978 to October 3, 1978. Average spot size found during the spot growth study was 25 trees (at detection). Average pine basal area

at the head of these spots was 120.3 sq ft/ac and the average pine-hardwood basal area was 148 sq ft/ac. These basal areas indicate that additional spot growth will occur in all stands where these spots are located (Hedden and Billings 1978).[4/]

DISCUSSION AND RECOMMENDATIONS

Suppression activities should be continued on the Strong River and Bienville Districts with emphasis on spots found in areas listed in tables 2 and 3. A salvage control action will minimize losses and prevent spot growth by removing infested material from the forest. Chemical suppression and/or cut-and-leave tactics are recommended only for inaccessible spots or for small spots that cannot be administered any other way. Forest Insect and Disease Management, Pineville, Louisiana, should be contacted prior to the extensive use of chemical control for update on latest restrictions or application procedures. If cut-and-leave is to be used, district personnel should plan a training session with FI&DM before the summer season (the summer is the only time this method is recommended for use). All suppression activity should be done in accordance with the 3400 section, FSM, and the project control plan for the Forest.

Predicting SPB mortality is difficult due to the occurrence of overlapping generations each year. The attack/emergence technique used for this evaluation predicts a population trend. This trend prediction has been proven accurate on a spot basis, but work continues to adapt these predictions to an area basis. For purposes of this evaluation, assumptions are that spot sizes and distribution within each age class of timber will remain the same. Another assumption is that the Volume Affected/Volume Protected ratio will remain the same with a static population.

Supplementary spot growth data show that spots expanded at a 34 percent rate of speed. While this indicates an increasing situation, it is for the summer months when this is a characteristic of spot growth. This supports the finding of the modified attack/emergence procedure which estimates that in FY 79 the population of southern pine beetles should be the same as last year. Assuming spot sizes and distribution to be the same as in FY 78, spots should either regenerate themselves at least one time (same spot as it is found now) or initiate another spot of the same size (static population) at a different location.

FY 78 records show that dense, natural stands in this age group have been the problem areas on the Strong River and Bienville Ranger Districts (SPB Information System and CISC). Many of the spots occur in timber 40 years and older (86 percent) on the Strong River District (32,118 acres > 40 years old (CISC). Greatest

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4/ Hedden, R. and R. Billings. 1978. SPB: Factors Influencing Growth and Decline of Summer Infestations in East Texas. Submitted For. Sci.

SPB spot loss will occur in these age groups of timber. Based on spot occurrence and basal areas as reported on the SPB Information System (1978), the compartments on the Strong River District where priority suppression action should be taken can be found in table 2. Table 3 lists problem compartments on the Bienville District where priority suppression work should be done. The compartments listed in the tables contain stands where significant losses have already occurred and could occur again.

During FY 79, compartment prescriptions on both the Strong River and Bienville Districts should deal with forest susceptibility to the SPB. Older, dense stands should be thinned as heavily as R8 guides allow. If possible, do not defer harvest cuts on those stands which are past rotation age. If stands must be deferred, the youngest and least dense stands should be left. The prescriptionist should address insect and disease problems on the "Other" section of the R8 2400-40 form.

Prevention of future losses by both districts can come about by making an effort each year to identify problem areas (FI&DM will aid in this) and treat them silviculturally to either remove or lessen SPB hazard on a stand by stand basis. Tables 4 and 5 list several compartments and stands for the prescriptionist to treat as potential problem areas when gathering data for the prescription.

Here are some factors the prescriptionist should consider for reducing SPB hazard:

1. Are the site and species well matched?

   A. If not, consider slash pine or hardwood for next rotation (if appropriate).

2. Is the site a littleleaf site? If so, then SPB could be a problem.

   A. Consider the site, can it really support pine? If so, is shortleaf the only pine it will support?

3. Is the site an annosus root rot site? If so, it is susceptible to SPB attack.

   A. Don't thin, (if loblolly) use wider spacing when planting.

   B. Plant longleaf when regenerating, if appropriate.

4. Alter stand density -- avoid basal areas in excess of 120 sq ft/acre.

5. Remove high risk trees (if operable).

6. Reduce disturbances by man.

All of these factors can be influenced by the prescription. Good forest management is the best way of reducing future SPB loss.

For further information, contact FI&DM, Pineville Field Office, Pineville, Louisiana 71360 (FTS 497-3311, Commercial 318-445-6511, Ext. 311).

Table 1. Attack:emergence, Bienville National Forest. (Factors are shown for both districts. Each district shows the same population trend.

Tree No.		Spot Number 1	2	3	4	5
1		1/4.18	1/2.3	1/4.8	1/4.0	1/6.88
2		1/7.28	1/6.80	1/7.29	1/1.2	1/9.9
3		1/8.7	1/7.07	1/6	1/7.12	1/6.5
4		1/3.5	1/9	1/5.1	1/8.5	1/7.2
5		1/8.7	1/7.2	1/6.5	1/9.5	1/9.9
	$\bar{x}$	1/6.47	1/6.47	1/5.94	1/6.06	1/8.08
TOTAL	$\bar{x}$	1/6.60				

STRONG RIVER DISTRICT

Table 2. Compartments and stands where priority control effort should be undertaken if infested by the SPB.

Compartment	Stands(s)	Acres	Compartment	Stand(s)	Acres
246	01	119	*205	09	36
227	01, 08, 06, 07	390	253	14, 15	234
224	04, 02	280	*250	09, 19	284
219	04, 03	90	*217	10	157
257	05, 27	237	*258	05	75
216	05, 09, 15	113	*260	02	114
*241	01, 04	1,213	*252	07	30
211	04	40	*214	04	162
*230	10, 16	46			
251	05, 10	236			
*264	05, 09, 21	299			
279	05	10			
209	08, 03	194			

* All these stands had losses greater than 10 MBF in at least one spot (SPB Information System)

BIENVILLE DISTRICT

Table 3. Compartments where priority control effort should be made if infested by the SPB. Bienville District (data is taken from flight maps which were transferred to clear acetate overlays - data is for all flights FY 78).

Compartments with 20 trees in at least one spot
87, 88, 83
66, 65, 63
61, 62, 76
77, 69, 26
25, 44, 54
53, 42, 24
23, 41, 40
22, 29, 38
39, 30, 20
16, 10, 12
4, 3, 2

STRONG RIVER DISTRICT

Table 4. Compartments and stands where the prescriptionist should be aware of possible loss to SPB (all these stands are 40 years in age).

Compartment	Stands	Acres
*241	1, 4	1,213
254	3, 4, 5, 9, 13, 14, 15, 16, 17, 18, 19	769
270	1, 3, 6, 7, 8, 9, 10, 11, 13, 14, 18, 19	821
*211	1, 5, 7, 8, 9, 10, 11	603
215	2, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13	552
220	1, 2, 4, 5	808
229	4, 5, 6	598
238	4, 5, 6, 9, 10, 11, 12, 13, 14, 15, 16, 19, 20	1,031
248	1, 2, 3, 4	701
272	3, 7, 8	402
206	2, 3, 4, 5, 6, 8	536

* These stands have a record of SPB losses and should be entered for preventative purposes as soon as management considerations permit.

BIENVILLE DISTRICT

Table 5. Compartments and stands where the prescriptionist should be aware of possible loss to SPB (all these stands are 40 years in age).

Compartment	Stands	Acres
59	1, 2, 3, 4, 5, 6, 7, 8, 9, 10	532
68	1, 2, 3, 4, 5, 6, 7, 8	986
71	1, 2, 3, 6	969
02	2, 4, 5, 7, 8, 9, 10	721
46	1, 6, 7, 8, 9, 10, 11, 12	661
27	2, 3, 6, 8, 9, 10, 11, 12	969
30	1, 2, 3, 4, 5, 7, 9, 12, 15	963
05	1, 2, 3, 4, 5, 6	1,138